

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE (DD-MM-YYYY) 2008-03-28		2. REPORT TYPE Final		3. DATES COVERED (From - To) 05/19/06 - 08/18/07	
4. TITLE AND SUBTITLE RHEEDAX Induced X-ray Fluorescence Analysis System for Oxide MBE				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER N00014-06-1-0854	
				5c. PROGRAM ELEMENT NUMBER	
				5d. PROJECT NUMBER	
6. AUTHOR(S) Hadis Morkoc, Ph.D.				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Virginia Commonwealth University School of Engineering Box 843068 Richmond, VA 23284-3068				8. PERFORMING ORGANIZATION REPORT NUMBER Final Technical; Index 542007	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) ONR REG ADMIN ATLANTA-N66020 100 Alabama St SW, Suite 4R15 Atlanta, GA 30303-3104				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for Public Release; distribution is unlimited					
13. SUPPLEMENTARY NOTES					
20080403152					
14. ABSTRACT A total reflection x-ray fluorescence spectroscopy system excited with an electron gun of reflection high-energy electron diffraction tool (RHEED-TRAXS) for in situ material characterization has been designed, components have been purchased, and the tool has been assembled and installed on a Riber 3200 molecular-beam epitaxy system customized for oxide growth.					
15. SUBJECT TERMS X-ray fluorescence spectroscopy, molecular-beam epitaxy, reflection high-energy electron diffraction, in situ characterization, material composition					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT		18. NUMBER OF PAGES
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified	SAR		19a. NAME OF RESPONSIBLE PERSON Hadis Morkoc
					19b. TELEPHONE NUMBER (include area code) 804-827-3765

## FINAL TECHNICAL REPORT

Grant No. N00014-06-1-0854, Office of Naval Research

Principal Investigator: Hadis Morkoc, Ph.D., Virginia Commonwealth University

### Equipment Acquired:

Set of equipment based on XR-100-CR X-ray detector (Amptek, Inc.) for assembling total reflection angle x-ray spectroscopy (TRAXS) system

Manufacturers included Amptek, Inc., Huntington Mechanical Laboratories, Inc., Pfeiffer Vacuum Inc., Kimball Physics Inc., and MDC Vacuum products corporation.

Total Costs: \$25,068 (ONR)

The equipment funds provided under the above referenced grant have been put to use as intended. As proposed, a total reflection x-ray spectroscopy system excited with an electron gun of reflection high-energy electron diffraction tool (RHEED-TRAXS) for in situ material characterization has been designed (the schematic of the RHEED-TRAXS system is shown in Fig. 1), components have been purchased, and the tool has been assembled and installed on a Riber 3200 molecular-beam epitaxy system customized for oxide growth.

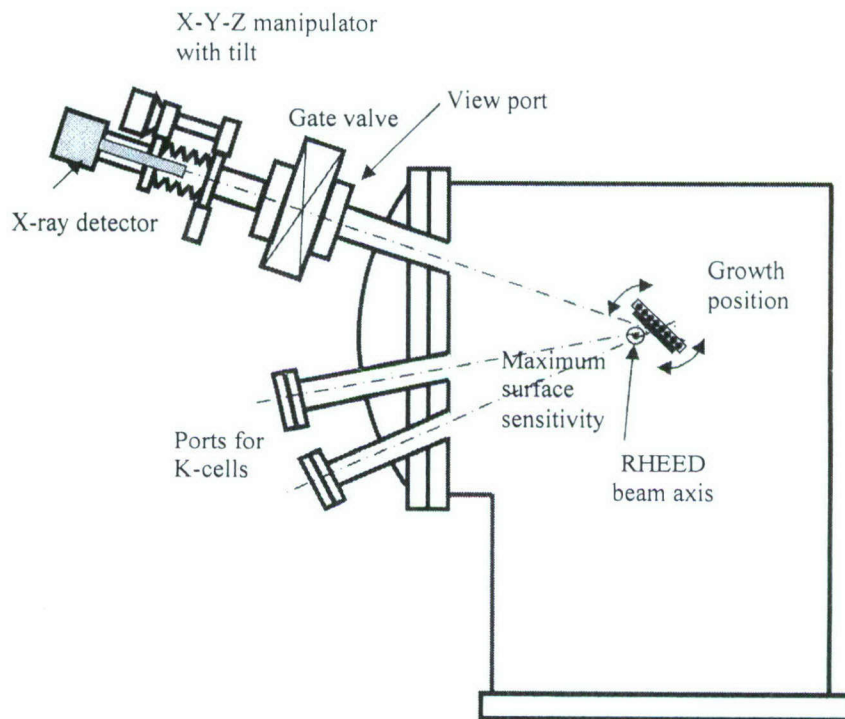


Fig. 1. Schematic of RHEED-TRAXS system designed for Riber 3200 growth chamber.

The system (shown in Fig. 2) consists of a compact and sensitive XR-100-CR X-ray detector with PX4 digital pulse processor mounted using CP75 feedthrough coupler (these components are manufactured by Amptek, Inc.) on a XYZ precise manipulator with tilt capability (Huntington Mechanical Laboratories, Inc.). The manipulator aimed for precise positioning of the x-ray detector and thus maximizing the signal intensity is connected using vacuum components (MDC Vacuum Products and Kimbal Physics, Inc.) to the conflate port of the ultra-high vacuum Riber 3200 molecular-beam epitaxy system. A compact turbo-drag station (Pfeiffer Vacuum Inc.) is used for differential pumping of the tool. The system was designed in such a way that allows one to utilize the substrate manipulator of the MBE system for controlling the angle of X-ray collection which is essential for improving the surface sensitivity. The RHEED-TRAXS system has been tested after the installation and the system is now fully operational.

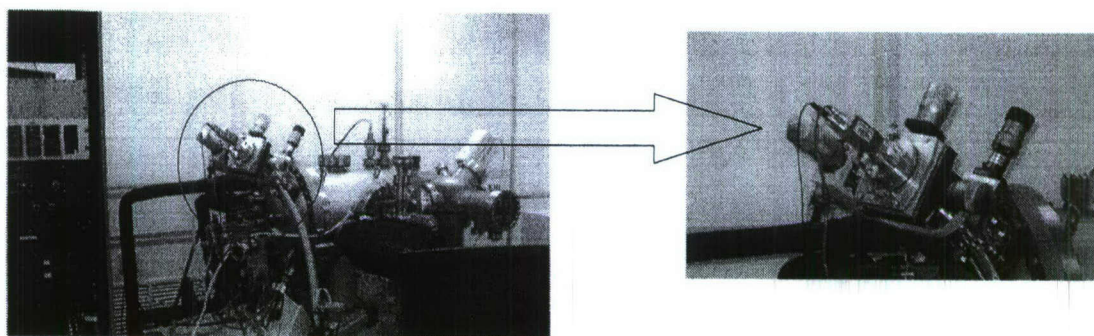


Fig. 2. Digital photo of RHEED-TRAXS tool installed on Riber 3200 growth chamber.